

HOLOGRAPHY

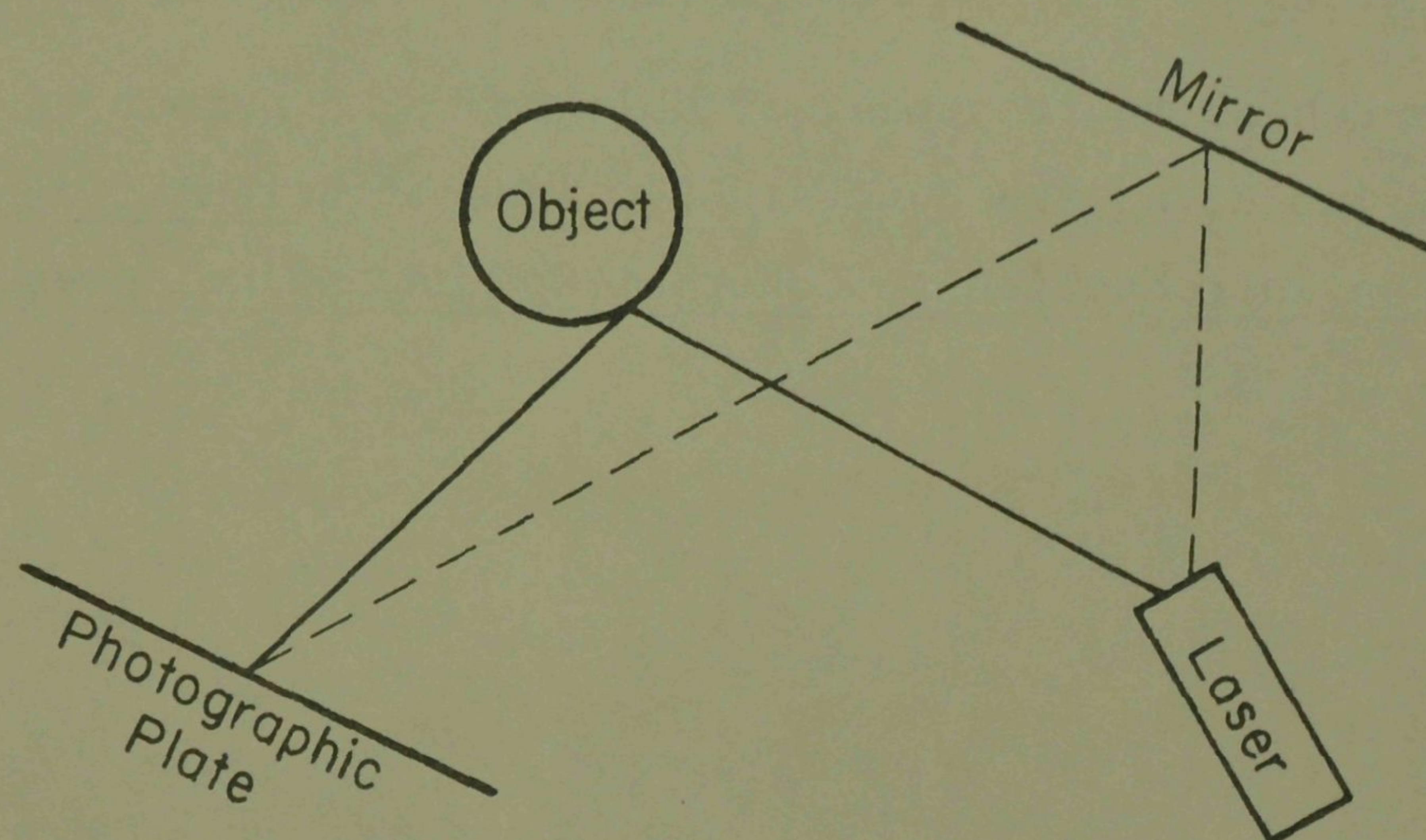
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A hologram is a particular way of photographically recording light waves that come from an object. In order to record the light in this approach two conditions must be met: (1) a suitable source of light must be used to illuminate the object, (2) a second set of suitable light waves must be present at the photographic plate to interact with the light coming from the object. It is this interaction, or interference, as it is commonly called, that is recorded on the photographic plate.

The method that was used to make holograms is shown here:



As the diagram shows, a laser was used with a diverging lens to illuminate both the object and the mirror. The mirror was used to obtain the reference light which interacts on the photographic plate with the light that is reflected from the object.

In order to recreate the image of the object, the photographic plate, after a normal chemical development process, is illuminated with a suitable light source at about the same angle at which the reference beam was incident on it. The interference patterns on the plate cause the illuminating light waves to behave in a manner identical to that of the waves that came from the object in the first place. Thus, the object is visually recreated.

The most obvious difference between the holographic reproduction and an ordinary photograph is the fact that the hologram exhibits all of the three-dimensional characteristics of the object, while a photograph is inherently two-dimensional.

A few of the possible applications of holography are:

- (1) Using a pulsed laser for a light source, it is possible to "stop" motion and make three-dimensional photographs of rapidly moving objects. Areas where this principle is used are the study of projectiles in flight, the study of shock waves and vibrations and the study of droplets in a fog or mist.
- (2) Using proper techniques, it is possible to record several images on a single photographic plate. Thus, it may be possible to make holographic three-dimensional movies.
- (3) Holograms are being considered as a new type of computer memory.
- (4) Studies are being made using holography as a means of information coding and decoding. Holography may provide a new means of pattern recognition for computers.

For a comprehensive treatment of holography, a number of references are available, including the June, 1965, issue of Scientific American, and the book, An Introduction to Coherent Optics and Holography by George Stroke.